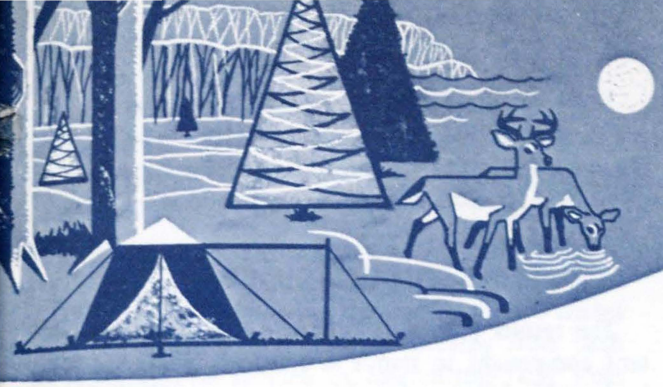

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RESEARCH NOTE NC-153

NORTH CENTRAL FOREST EXPERIMENT STATION, FOREST SERVICE—U.S. DEPARTMENT OF AGRICULTURE

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TAMARACK SEEDLINGS PROSPER ON BROADCAST BURNS IN MINNESOTA PEATLAND

ABSTRACT. – Six-year results from two strips clearcut and broadcast burned in a peatland forest indicate that tamarack will be an important component in new stands on such areas if even a few seed-bearing tamaracks are within 3 chains.

OXFORD: 231.322:436:174.7(776) *Larix laricina, Picea mariana.* **KEY WORDS:** *Larix laricina, Picea mariana,* **natural reproduction, slash burning.**

Little is known about how to reproduce tamarack (*Larix laricina* (Du Roi) K. Koch) after harvest cutting, even though this peatland conifer occupies almost 1 million acres of commercial timberland in the Lake States. Tamarack is also a common associate in other forest types on peatland, especially the black spruce (*Picea mariana* (Mill.) B.S.P.) type in Minnesota.

An early researcher in Minnesota found that slash hinders tamarack reproduction on cutover areas, but he observed that areas broadcast burned to reduce tamarack slash still had no seedlings several years later (Duncan 1952, 1954). However, recent research indicates that tamarack does reproduce on slash-burned seedbeds in *black spruce* peatlands containing some tamarack. Tests that utilized progressive burning of piled slash showed a much higher stocking of tamarack seedlings on burned spots than on the surrounding unburned moss (Johnston 1971). The present study shows that even with a limited seed supply, tamarack can reproduce successfully and outgrow black spruce on broadcast burns. Based on this finding, alternative practices are suggested for increasing or decreasing the reproduction of tamarack on broadcast-burned peatlands.

PROCEDURE

The study was made in a peatland forest near Big Falls in north-central Minnesota. Tamarack and black spruce seedlings were sampled on two clearcut strips 6 years after broadcast burning. The strips are 3 and 5 chains wide, one-half mile long (in a north-south direction), and about one-fourth mile apart. They were cut in winter and burned the following summer; this sequence was applied to one strip and then a year later to the other strip.[1] Severity of burning was moderate to high, with most slash, undergrowth, and dry moss being consumed on both strips. The uncut forest bordering the strips is predominantly mature spruce, but contains some tamarack and an undergrowth of brush and grass. Site quality ranges from medium to good.

In evaluating the effect of the uncut forest on composition of the reproduction, seedlings near the windward (west) side of the clearcut strips were assumed to have originated mainly from seed shed by trees bordering that side. The following data for tamarack and black spruce were obtained for each strip: (1) number and basal area of trees (more than 3.5 inches d.b.h.) in a zone extending 8 chains along the west side and one-half chain into the forest, and (2) number of seedlings on 40 milacre quadrats lined up 1 chain east (downwind) of this side. On each quadrat the competitive position of these seedlings was compared by measuring the height of the tallest tamarack and spruce, and their surrounding vegetation.

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[1] *The cooperation of the Minnesota Department of Natural Resources, Division of Lands and Forestry, is gratefully acknowledged.*

In addition, the overall distribution (milacre stocking) of tamarack and black spruce seedlings was determined for each strip by sampling an area the width of the strip and one-fourth mile long. Fifty milacre quadrats were systematically located in the 3-chain-wide strip and 100 quadrats in the 5-chain-wide strip.

RESULTS

Tamarack seedlings were outnumbered by black spruce 6 years after burning, but tamarack actually reproduced more successfully considering it made up a small proportion of the trees in the uncut forest (table 1). Only 27 percent of the trees (by number and basal area) bordering one strip (A) were tamarack, compared with 43 percent for the seedlings 1 chain downwind. The tamarack percentages were very low for the other strip (B) because black spruce was so predominant (table 1). Nevertheless, with only 12 tamarack trees (4 square feet of basal area) per acre bordering the strip, tamarack seedlings averaged 4,400 per acre.

Although outnumbered by black spruce, tamarack seedlings overtopped spruce on both strips (fig. 1). The tallest tamarack per milacre quadrat averaged twice the height of the tallest spruce (table 1). On strip B, 76 percent of the tallest tamaracks were also taller than their surrounding vegetation, compared with only 15 percent for spruce. On strip A nearly all of the tallest seedlings were overtopped by surrounding vegetation,[2] but tamarack was taller than spruce and thus occupied a better competitive position. The combined data for both strips showed that tamarack was the tallest seedling on 73 percent of the quadrats 1 chain from the windward side, whereas spruce was tallest on only 19 percent; the remaining 8 percent were nonstocked.

The overall distribution of tamarack seedlings was practically as good as that of black spruce in both strips. Milacre stocking averaged 76 percent for tamarack and 85 percent for spruce 6 years after broadcast burning.

DISCUSSION

The results indicate that tamarack will be an important component in stands established on burned peatlands within 3 chains of seed-bearing tamaracks. Tamarack seedlings were twice as tall as spruce whether overtopped or not by other vegetation on the burn. Tamarack saplings observed on local peatlands clearcut earlier are

Figure 1. – Typical profile of seedlings 6 years after broadcast burning: a 4-foot tamarack (left), willows (center), and a 2-foot black spruce (right).

[2] *Mainly grass (especially* Calamagrostis canadensis *(Michx.) Beauv.), willow (*Salix *spp.), and some speckled alder (*Alnus rugosa *(Du Roi) Spreng.).*

Table 1. – Average density of trees bordering the two strips, and density and height of seedlings 1 chain downwind 6 years after broadcast burning.

Strip	Species	Trees: Stems per acre	Trees: Basal area per acre	Seedlings: Stems per acre	Seedlings: Height 1/
		Number	Square feet	Number	Inches
A	Tamarack	55	17	4,200	21
	Black spruce	152	45	5,500	10
B	Tamarack	12	4	4,400	39
	Black spruce	275	85	60,000	21

1/ Tallest seedling per milacre.

also much taller than their black spruce associates. So, even if outnumbered by spruce, tamarack will probably account for most of the dominant trees when crown closure occurs.

This means that forest managers who want predominantly black spruce in new stands should harvest or otherwise kill all seed-bearing tamaracks within 3 chains of clearcut areas *before* burning. Seeding from such trees could also be avoided by clearcutting large areas whose interiors are beyond the seeding range of tamarack. Pure stands of spruce could then be established by direct seeding. However, if forest managers want predominantly tamarack, the foregoing practices should be reversed; that is, eliminate natural seeding of spruce and direct-seed tamarack where required.

Although broadcast burning of slash is probably effective for establishing tamarack on many areas, this technique may be impractical or unnecessary under certain conditions. Recent experience near Big Falls, Minnesota, indicates that broadcast burning slash from pure stands of tamarack is very difficult.[3] Tamarack has also become well established on some unburned areas in the vicinity. Therefore, additional research is needed to find the most effective *and* economical technique for establishing tamarack under common conditions.

[3] *Correspondence from Fred Wintermantel, Minnesota Department of Natural Resources, Division of Lands and Forestry, 1972.*

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